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85-50 MGB-1928-08 1928-08
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 285 1 SHEET

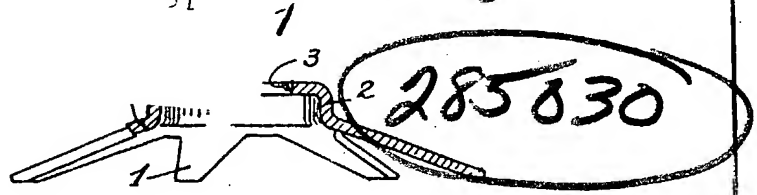


Fig. 2

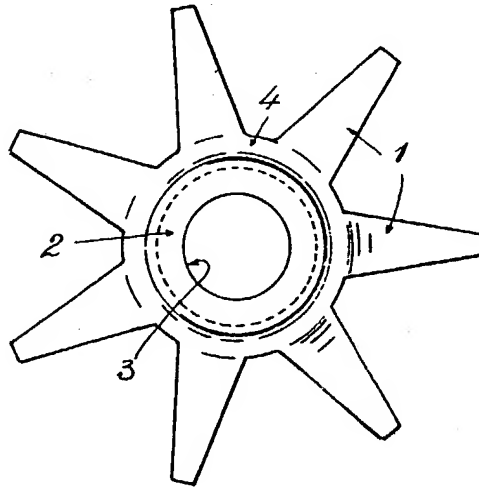


Fig. 3

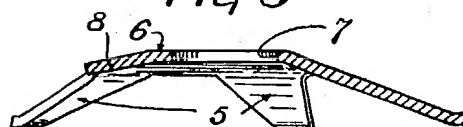
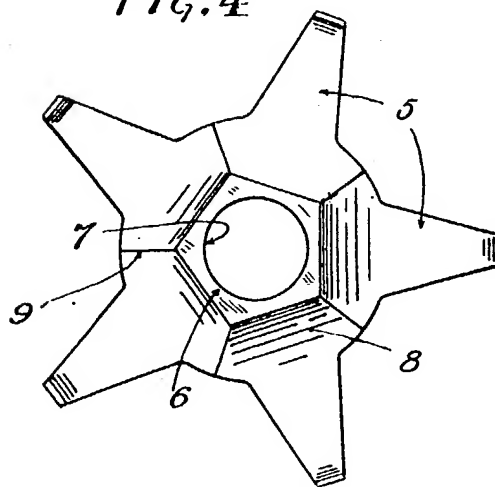


Fig. 4



[This Drawing is a reproduction of the Original on a reduced scale.]



PATENT SPECIFICATION

Convention Date (France): Feb. 9, 1927.

285,030

Application Date (in United Kingdom): Jan. 25, 1928. No. 2457/28.

Complete Accepted: Aug. 16, 1928.

COMPLETE SPECIFICATION.

Star Shaped Spring Washer.

We, COMPAGNIE D'APPLICATIONS MECAN-
QUES, a société anonyme organised under
the laws of France, of 42, rue Franklin
Ivry-Port (Seine), France, do hereby
5 declare the nature of this invention and in
what manner the same is to be performed,
to be particularly described and ascer-
tained in and by the following
statement:—

10 The present invention concerns star
shaped spring washers, and more specially
those used for adjusting the tension in
shock absorbers of the friction type inter-
posed between the suspended and unsus-
15 pended parts of automobile vehicles for
damping the relative motions occurring
between the said parts during the running
of the vehicle.

The invention consists in a star shaped
20 spring washer, pressed from a metal sheet
of uniform thickness, comprising a central
part and radially disposed branches or
extensions, in which the central part is so
shaped that its moment of inertia rela-
25 tive to a radial axis situated in the plane
in which the ends of the branches or
extensions lie and passing through the
end of one of the branches or extensions
is larger than the moment of inertia of a
30 substantially flat surface located at the
same average distance from the said plane.
Accordingly, the mass of the said central
part is distributed over a height as large
as possible.

35 The invention also consists in a star
shaped washer in accordance with the pre-
ceding paragraph in which spaced
branches or extensions tapering outwards
away from the centre are so constructed
40 that the stress distribution is normal
throughout their entire length.

Owing to this arrangement a spring
washer is obtained the central part of
which is stiff and opposes any substan-
45 tial distortion in operation whereas all
the elasticity is confined to the branches
or extensions.

The substantially rigid central part
can be cup-shaped and the branches or
50 extensions of the star may connect there-
with along a more or less pronounced
cone. The entire washer, i.e. both the
substantially rigid central part and the
elastic branches or extensions connecting

[Price 1/-]

thereto, can be directly pressed to the
shape of a truncated pyramid; such an
arrangement enables the stiffness in the
centre and the shape of the resilient or
elastic parts to be obtained with a single
operation, without any difficulty in
55 machining.

The circle on which the resilient or
elastic branches or extensions of the star
meet the stiff central part may have any
suitable diameter, and the distance
60 between the said branches or extensions,
along the said connection circle, has suffi-
cient value to enable the stresses and the
fatigue to be supported by the branches or
extensions, and not by the central part.

When comparative tests were made with
hitherto known washers and washers
according to the present invention it has
been found in every case that breaks or
permanent distortion take place in an
70 entirely different manner. In the hither-
to known types, breaks or permanent dis-
tortion occur on an approximately radial
plane, which renders the washer useless,
whereas with the star washers according
80 to the invention, breaks or permanent dis-
tortion take place first on one of the
branches or extensions along a plane sub-
stantially tangent to the connection circle
to the central part and at right angles to
85 the radius, enabling the washer to still
perform its function partially, on account
of the presence of the other branches or
extensions.

This arrangement has further the
90 advantage that the elastic distortions are
really proportional to the loads, each
branch or extension being to be con-
sidered as a leaf spring of correct shape
supporting a load at one end and securely
95 clamped at the other, thus permitting,
when these washers are applied, to
accurately adjust the pressures, propor-
tionally to the deflection of the spring
washer.

Two forms of construction according to
the invention have been illustrated by way
of example in the accompanying drawing
in which:

Figs. 1 and 2 are respectively a vertical
105 section and a plan view of one form of
construction;

Figs. 3 and 4 are respectively a vertical

section and a plan view of another form of construction.

In the example illustrated Figs. 1 and 2, the star washer pressed in a metal sheet of uniform thickness has seven branches or extensions 1 and a central part 2 bored with a hole 3 enabling a bolt or a similar fastening member to pass through. The purpose of the invention is to impart to the central part 2 sufficient stiffness so that no substantial distortion will occur in operation, the elastic work of the washer being then supported by the branches or extensions 1.

In the example shown in Figs. 1 and 2 such a result is obtained by pressing the central part so that it is cup shaped with the concave side turned towards the branches or extensions 1. In this manner, when pressure is applied to the washer, the central part will not be subjected to distortion on account of its large relative moment of inertia, whereas the branches or extensions 1 are resiliently distorted. In case of abnormal pressure and always on account of the large moment of inertia of the central part 2, the latter remains unaffected and the branches or extensions 1, will be subjected to permanent distortion or break according to the value of the applied force. It is obvious that if one of the branches or extensions breaks, the washer is still able to perform its function owing to the presence of the remaining branches or extensions, whereas when the central part 2 breaks along an approximately radial plane, the washer is put completely out of commission. The branches or extensions 1 of the star can be connected to the central part 2 through a more or less tapered cone 4.

In the example illustrated in Figs. 3 and 4, the washer also pressed from a metal sheet of uniform thickness is provided with five branches or extensions 5 and the central part comprises a flat face 6, the area of which is just sufficient to serve as a seat for the assembling bolt or a similar member passing through the hole 7, and a truncated pyramidal shaped surface 8 the angles 9 of which are located in the spaces between two successive branches or extensions 5.

It will be observed that this shape also increases the moment of inertia of the central part relative to an axis situated in the plane in which the ends of the branches or extensions 5 lie. In this manner all the resilient work to be furnished by the washer is supported by the branches or extensions 5 and the central part 6-8 does not undergo any distortion in operation. Further, this arrangement enables the stiffness of the central part and the correct shape of the

resilient parts to be obtained at the same time, by a single pressing operation, without any difficulty in machining.

The branches or extensions 1 and 5 are preferably tapered away from the central part so that, for each branch or extension, any cross section at right angles to the axis of the said branch or extension shows an area corresponding to the maximum bending moment that said section has to withstand.

In spite of the stiffness imparted to the central part, a spring is thus obtained having a greater effective resiliency than that of the other star washers of any known type.

The meeting circle of the resilient branches or extensions 1 or 5 with the stiff central part 2 or 8 may have any suitable diameter, and the distance along the said circle, between two successive branches or extensions, is taken sufficiently great so that the stresses and the fatigue are supported by the branches or extensions and not by the central part.

It is to be understood that modifications may be made in the forms of construction described and illustrated without exceeding the limits of the invention.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A star-shaped spring washer, pressed from a metal sheet of uniform thickness, characterised by the fact that the central part is so shaped that its moment of inertia relative to a radial axis situated in the plane in which the ends of the branches or extensions lie and passing through the end of one of the branches or extensions, is larger than the moment of inertia of a substantially flat surface located at the same average distance from the said plane.

2. A star-shaped washer according to Claim 1, characterised by the fact that the mass of the central part is distributed over a height as large as possible.

3. A star-shaped washer as claimed in Claim 1 or 2, characterised by spaced branches or extensions tapering outwards away from the central part, said branches or extensions being such that the stress distribution is normal throughout their entire length, whereby the resilient distortion is supported by and distributed over the entire length of the said branches.

4. A star-shaped washer according to Claim 3 characterised by the fact that the practically rigid central part is cup-shaped.

5. A star-shaped washer according to

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Claim 3 characterised by the fact that the central part and the branches or extensions connecting thereto are shaped in the form of a truncated pyramid.

- 5 6. A star-shaped washer according to Claim 1, characterised by the fact that the branches or extensions are sufficiently spaced away from each other, along the connection circle to the stiff part, so that
10 breakage or permanent distortion cannot take place within the central part.

7. A star-shaped spring washer substantially as described with reference to the drawing.

Dated the 23rd day of January, 1928.

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